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The impact of shade on morphology, growth and biomass allocation in *Picea sitchensis*, *Larix × eurolepis* and *Thuja plicata*

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Abstract To determine the effect of shade on morphology, growth and biomass allocation in *Picea sitchensis*, *Larix × eurolepis* and *Thuja plicata*, seedlings were grown in the open or under shadehouses providing 25%, 50% and 75% reductions of full-light for two growing seasons. For most of the characteristics assessed there was no significant interaction between species and shade indicating that the morphological responses to changing shade treatments were not species-dependent. After two growing seasons the mean height increment for the three species was significantly greater in 25% (76.1 cm) and 50% shade (74.9 cm) than in the open (69.5 cm). Root collar diameter increment, shoot, root and total biomass declined significantly with increasing shade while the opposite was true for the height:diameter ratio. In both western red cedar and hybrid larch the shoot:root ratio was significantly greater in the shade while in Sitka spruce this characteristic was not influenced by shade. While all species had significantly greater specific shoot areas in 75% shade than in 0% shade, this trend was particularly pronounced in hybrid larch. In hybrid larch and western red cedar, the normalised specific projected shoot area increased significantly with increasing shade. The opposite trend was observed for Sitka spruce. We conclude that in the main the species studied demonstrated similar shade acclimation responses despite their reported differences in shade tolerance.

Keywords Shadehouses · Height increment · Root collar diameter increment · Specific shoot area · Shade tolerance

Introduction

In Ireland, the majority of forests are managed under the clearfell system. However, Ireland's commitment to sustainable forest management and society's desire for a

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